

# Characteristics of patients from the Polish Registry of Acute Coronary Syndromes during the COVID-19 pandemic: the first report

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**Introduction** The coronavirus disease 2019 (COVID-19) pandemic has affected the entire global healthcare system. According to reports from different countries, the number of patients with myocardial infarction (MI) treated in 2020 has decreased by 40% to 50% as compared with the corresponding period in 2019.<sup>1-7</sup> This refers both to patients with ST-segment elevation myocardial infarction (STEMI) and with non-ST-segment elevation myocardial infarction (NSTEMI).<sup>2,5,6</sup> A similar situation occurred in Poland, even though cardiology centers were prepared for activity and provided appropriate logistics.<sup>6,7</sup>

Except for data on the number of patients, so far, there has been little information on the clinical characteristics of MI patients referred for invasive diagnostics during the COVID-19 pandemic. An Italian registry showed that patients treated at cardiology centers during the epidemic were older than those treated in 2019. Additionally, there were fewer women among patients treated for MI.<sup>5</sup>

Based on the data from the Polish Registry of Acute Coronary Syndromes (PL-ACS) collected

during the COVID-19 era and the corresponding period in 2019, we compared treatment logistics and clinical characteristics of patients with acute coronary syndromes (ACS) treated in these 2 time intervals.

**Methods** The Polish Registry of Acute Coronary Syndromes (PL-ACS) is a national, prospective registry which, since 2003, has been collecting data on acute coronary syndromes, including the incidence rate, patient clinical characteristics, therapeutic procedures as well as in-hospital and long-term outcomes. Currently, the registry data are entered by the attending physician via an online form. In 2019, the median (interquartile range [IQR]) time from admission of an ACS patient to reporting the patient file in the computer system was 32.5 (9–81) days. By the end of 2019, data on 749 821 patients with ACS were gathered in the PL-ACS. More information on the registry was provided previously.<sup>8</sup>

Patients with a diagnosis of STEMI or NSTEMI hospitalized during the lockdown period of

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**TABLE 1** Characteristics of patients diagnosed with acute myocardial infarction before and during the coronavirus disease 2019 pandemic

Variable		March–May 2019 (n = 7844) <sup>a</sup>	March–May 2020 (n = 3457) <sup>b</sup>	P value
Age, y		68 (61–76)	67 (60–75)	<0.01
Male sex		5133 (65.44)	2293 (66.33)	0.36
Mode of admission	Transfer from another hospital	3157 (40.42)	1223 (35.53)	<0.001
	Admission from home (through the EMS)	3236 (41.43)	1654 (48.05)	
	Self-admission to hospital	652 (8.35)	257 (7.47)	
	Referred by the general practitioner	503 (6.44)	190 (5.52)	
	Referred by the specialist outpatient clinic	262 (3.35)	118 (3.43)	
Killip–Kimball classification	I	6312 (81.57)	2807 (81.79)	0.73
	II	983 (12.7)	417 (12.15)	
	III	228 (2.95)	103 (3)	
	IV	215 (2.78)	105 (3.06)	
Diagnosis	STEMI	2828 (36.05)	1308 (37.83)	0.07
	NSTEMI	5017 (63.95)	2150 (62.17)	
Sudden cardiac arrest before admission		213 (2.75)	118 (3.43)	0.049
Time from onset of pain to hospital admission	STEMI (direct admission)	180 (101–400)	180 (100–414)	0.73
	STEMI (transfer from another hospital)	316 (171–720)	290 (146–697)	0.14
	NSTEMI (direct admission)	409 (173–1285)	390 (173–1510)	0.78
	NSTEMI (transfer from another hospital)	609 (298–1560)	660 (350–1589)	0.09
Time from admission to angiography, min	STEMI	25 (11–59)	21 (10–50.5)	<0.001
	NSTEMI	229 (61–839)	232.5 (68–897)	0.32
Left ventricular ejection fraction, %		50 (40–55)	48 (40–55)	0.16
Multivessel coronary artery disease		2994 (44.12)	1270 (42.42)	0.12
Percutaneous coronary interventions		6345 (81.40)	2839 (82.22)	0.30
CABG	Yes, during hospitalization	15 (0.19)	7 (0.21)	<0.001
	No, but referred for CABG	234 (3.04)	119 (3.49)	
	No, but planned after discharge	296 (3.85)	71 (2.08)	
	Not planned	7148 (92.92)	3215 (94.23)	
Intra-aortic balloon pump		31 (0.4)	8 (0.23)	0.16
Cardiogenic shock		167 (2.18)	83 (2.45)	0.39
Length of hospitalization, d		5 (3–7)	5 (3–7)	0.56

Data are presented as median (interquartile range) for continuous variables and number (percentage) of patients for categorical variables.

**a** Period from March 3, 2019 to May 31, 2019

**b** Period from March 1, 2020 to May 31, 2020

Abbreviations: CABG, coronary artery bypass grafting; EMS, Emergency Medical Services; NSTEMI, non–ST-segment elevation myocardial infarction; STEMI, ST-segment elevation myocardial infarction

the COVID-19 pandemic (March 1, 2020–May 31, 2020) were included in the present analysis. The control group comprised patients with a diagnosed MI hospitalized during the corresponding period in 2019 (March 1, 2019–May 31, 2019).

The analysis included demographic data, clinical characteristics, and hospital procedures reported to PL-ACS by May 1, 2020. The approval of an ethics committee was not required for this analysis.

**Statistical analysis** The distribution of continuous variables was nonnormal based on the Shapiro–Wilk test; therefore, they were presented as medians and IQR and compared with the Mann–Whitney U test. Qualitative variables were presented as number and percentage of patients and compared with the  $\chi^2$  test. The *P* value of less than 0.05 was considered significant. Statistical analysis was performed using the Statistica software, version 13.3 (TIBCO Software Inc., Palo Alto, California, United States).

**Results and discussion** Data on treatment logistics and clinical characteristics of the MI patients are presented in TABLE 1. In comparison with the control group, patients treated in 2020 were slightly younger (median [IQR] age, 68 [61–76] years vs 67 [60–75] years, respectively), and more often experienced sudden cardiac arrest (SCA) prior to hospital admission (2.75% vs 3.43%, respectively). There was also a trend toward a higher rate of STEMI during the COVID-19 period (36.05% in 2019 vs 37.83% in 2020).

There is paucity of clinical data on MI patients treated during the COVID-19 pandemic. In an Italian registry, in contrast to our observations, patients treated during the pandemic were older than those treated in the corresponding period in 2019.<sup>5</sup> It is possible that fear of infection was greater among the elderly Polish patients. Moreover, elderly patients more often experience atypical symptoms, which, combined with the symptoms of COVID-19 (dyspnea, chest discomfort), could be confusing for those patients and discourage them from contacting the healthcare services. Data available both in Poland and across the world suggest that a greater reduction in the number of treated patients is observed for NSTEMI than for STEMI patients.<sup>5,6</sup> This may result from various factors: NSTEMI symptoms are less conclusive, and the patient group is much more heterogeneous. Moreover, NSTEMI patients are usually older, and perhaps the above-mentioned factors regarding the elderly also played a role. Additionally, the reorganization of the healthcare system might have affected the selection of patients referred for invasive diagnostics in the first place. The frequency of prehospital SCA is often related to treatment delay. Data from Italy and China suggest that time from onset of pain to treatment has become significantly longer.<sup>1,5</sup> Data from our analysis do not confirm these observations. We have noticed no significant differences in terms of the length of transport time from other hospitals for STEMI patients (median [IQR], 316 [171–720] min in 2019 vs 290 [146–697] min in 2020) and a trend toward longer transport time for NSTEMI patients (median [IQR], 609 [298–1560] min in 2019 vs 660 [350–1589] min in 2020). It cannot be ruled out, however, that some of the patients waited for contact

with a healthcare professional for a longer time, which could have caused a higher frequency of prehospital SCA in 2020.

We observed significant differences in the mode of admission to a cardiology center. During the epidemic, more patients were transferred by the Emergency Medical Services (EMS; Państwowe Ratownictwo Medyczne) directly to the hospital, with a lower number of patients transferred from other hospitals (41.43% vs 48.05%, and 40.42% vs 35.53% in 2019 and 2020, respectively). In the present analysis, it is not possible to establish the cause of this phenomenon. Perhaps the reorganization of the healthcare system and difficulties with admitting and transferring patients to and from other hospitals resulted in a higher frequency of direct transport by the EMS, especially with regard to patients diagnosed with STEMI. Additionally, a shorter time from admission to coronary angiography was observed in STEMI patients (median [IQR], 25 [11–59] min vs 21 [10–50.5] min in 2019 and 2020, respectively). It seems that the suspension of planned admissions and procedures could have caused a higher availability of cardiac catheterization laboratories. On the other hand, new rules of patient admission introduced during the epidemic lengthened the initial medical activities. It is possible this did not apply to STEMI patients.

We did not observe any differences in the incidence of multivessel disease or the number of percutaneous coronary interventions. Nevertheless, during the pandemic, patients were significantly less frequently referred for coronary artery bypass graft (CABG) surgery (7.08% vs 5.77% in 2019 and 2020, respectively). The number of patients referred for CABG during initial hospitalization did not change, but the number of planned cardiosurgical procedures after hospital discharge was reduced. Similarly, as above, we may only hypothesize about the causes. It could be that during the epidemic, doctors and patients less frequently decided to carry on with the planned postdischarge treatment. It is also possible that in patients with a less advanced multivessel disease, subsequent percutaneous coronary interventions were more frequently performed during the initial hospitalization. However, we have no data that could explain this issue. Moreover, CABG is more often performed in NSTEMI patients, who were treated less often in 2020, which could have affected the total number of CABG procedures performed.

**Limitations** This is a retrospective analysis, therefore it involves all the inherent limitations. Data for 2019 and 2020 come from various reporting centers, which often represent different medical units. Also, we do not yet have full clinical and angiographic characteristics of the analyzed patients, which prevents accurate

comparison of the patients' clinical profiles in the analyzed years. Additionally, the absolute number of patients treated in 2020 cannot be directly compared with data from 2019, as not all patients during this period were reported to the PL-ACS pending data analysis.

**Conclusions** The COVID-19 epidemic caused a reduction in the number of patients admitted to hospitals with a diagnosis of STEMI and NSTEMI. The MI patients treated during the COVID-19 pandemic were more often taken to the hospital by direct transport of the EMS. Moreover, prehospital cardiac arrest was more frequent. The time from admission to coronary angiography was shorter among the STEMI patients, and the number of patients referred for CABG was lower.

#### ARTICLE INFORMATION

**CONFLICT OF INTEREST** None declared.

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